82d Congress, 2d Session - - - - - House Document No. 398

SNY WATERSHED, ILLINOIS

LETTER

FROM

ACTING SECRETARY

DEPARTMENT OF AGRICULTURE

TRANSMITTING

A SURVEY REPORT, DATED MAY 1950, TOGETHER WITH ACCOMPANYING PAPERS AND ILLUSTRATIONS, OF THE SNY WATERSHED IN ILLINOIS MADE UNDER THE PROVISIONS OF THE FLOOD CONTROL ACT APPROVED JUNE 22, 1936, AS AMENDED AND SUPPLEMENTED

MARCH 20, 1952.—Referred to the Committee on Public Works and ordered to be printed with illustrations

UNITED STATES
GOVERNMENT PRINTING OFFICE
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LETTER OF TRANSMITTAL

DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, March 10, 1952.

The SPEAKER, HOUSE OF REPRESENTATIVES.

DEAR MR. SPEAKER: I am submitting herewith a survey report dated May 1950, together with accompanying papers and illustrations, of the Sny watershed in Illinois made under the provisions of the Flood Control Act approved June 22, 1936, as amended and supplemented.

I recommend that the Secretary of Agriculture be authorized to carry out the program of runoff and waterflow retardation and soil-erosion prevention proposed in this report.

Enclosed are comments received from the Governor of Illinois and interested Federal agencies.

The Bureau of the Budget, in its letter of February 25, 1952, advises that there is no objection to the submission of this report to the Congress. The Bureau further advises that it is in agreement with the objective contemplated in the report of carrying out measures designed to retard floods and prevent soil erosion, and that this objective is particularly desirable from the point of view of coordination of upstream measures with the flood-control programs of the Corps of Engineers. A copy of the letter from the Bureau of the Budget is enclosed.

Sincerely,

K. T. HUTCHINSON,
Acting Secretary.

SNY WATERSHED, ILLINOIS

LETTER FROM THE BUREAU OF THE BUDGET TO THE SECRETARY OF AGRICULTURE

EXECUTIVE OFFICE OF THE PRESIDENT,
BUREAU OF THE BUDGET,
Washington 25, D. C., February 25, 1952.

The honorable the SECRETARY OF AGRICULTURE.

MY DEAR MR. SECRETARY: This will acknowledge receipt of Acting Budget Officer J. L. Wells' letter of January 9, 1951, requesting advice as to the relationship to the President's program of the proposals contained in your Department's report entitled "Interim Survey Report, the Sny Watershed, Illinois."

Erosion, inundation, and sediment damages occurring in the Sny watershed are estimated to average $1,190,314 annually. The principal estimated annual losses are agricultural. Floods also cause damages to roads and urban areas, while sediment damages occur to water supplies, drainage channels, reservoirs, and public health.

It is proposed to alleviate these damages and to realize extensive associated benefits by installing a number of interrelated and interdependent soil and water conservation and control measures or groups of measures, mostly vegetative in character, during a 10-year period. These measures, applied in proper combination with other soil and water conservation practices and measures, would constitute a basic system of soil and water conservation in accordance with needs and capabilities of the land in the Sny watershed. Educational assistance and technical services are also recommended as a part of the proposed program.

The estimated total cost of the recommended program, based on 1948 prices and an intermediate level of employment, is $9,794,183. The Federal Government would be expected to expend $6,542,777 of the total cost; non-Federal public agencies and private interests would contribute $3,251,406 or its equivalent in labor, materials, equipment, land easements, rights-of-way, and other assistance in lieu of cash payments. Operation and maintenance of the recommended works of improvement are estimated to cost $83,516 annually, which would be paid by local interests.

It is estimated that the recommended watershed program, if installed as planned and maintained adequately, will yield average annual benefits evaluated at $1,677,607. Reduction in erosion damages is estimated at $731,666, reductions in inundation and sediment damages are estimated at $151,817, and conservation and land enhancement benefits are estimated at $794,124. These benefits would result mainly from the provision of farm waterways, terraces, pasture development, floodwater-retarding structures, and other conservation measures.

The total average annual costs are estimated at $273,858. Since prices are expected to vary during the 10-year installation period, both benefits and costs were adjusted to anticipate future price levels by applying indexes provided by the Bureau of Agricultural Economics. Thus, the average annual benefits are adjusted to $873,185 and the costs, on the same basis, to $243,518. This adjustment results in a revised benefit-cost ratio of 3.59 to 1 for the recommended program.

The report has been reviewed by the Governor of Illinois and by the several concerned Federal agencies, in accordance with policies and procedures for distribution and coordination of reports as adopted by the Federal Inter-Agency River Basin Committee. The views expressed are generally favorable to the proposed program, with suggestions limited to considerations that could be resolved cooperatively by the concerned agencies or local interests during the periods of planning and installing the watershed works of improvement.

The work envisioned in the report constitutes predominantly open-land, farm, and woodland improvement measures which will produce very high conservation benefits, accruing mainly to landowners and farm operators in the form of increased returns due to improved practices. The program recommended includes an intensification, acceleration, and adaptation of soil and water conservation activities already in progress under going programs of the Department of Agriculture. These include such programs as the conservation and use program, authorized by the Soil Conservation and Domestic Allotment Act, approved February 29, 1936, as amended; the Soil Conservation Service's program of assistance to districts and other cooperators, authorized by the act of April 27, 1935; and State and private forestry cooperation, pursuant to the act of August 25, 1950, sections 1 through 5 of the act of June 7, 1924, and acts supplementary thereto.

The Bureau of the Budget is in agreement with the objective contemplated in the report of accelerating land-treatment measures and installing structural measures designed to retard floods and prevent soil erosion. This objective is particularly desirable from the point of view of coordination of upstream measures with the flood control programs of the Corps of Engineers.

The measures contemplated to implement the proposed program may be grouped into two broad categories—land-treatment measures and structural measures. The Bureau of the Budget is of the opinion that installation of the structural measures (shown in table 2, page 14 of the report as "Minor watershed waterway improvement," "Diversions," "Upstream floodwater retarding structures," and "Tributary channel improvement") should properly be authorized under the Flood Control Act, as amended and supplemented. The Bureau also believes that the land-treatment measures set forth in the report, since they are largely an acceleration of existing programs of the Department of Agriculture, should be financed under appropriations other than that for the Flood Control Act. This would avoid confusion in the presentation of the Department's budgetary program, since many of the current land-treatment programs of the Department have the objective of runoff and waterflow retardation and the prevention of soil erosion. To the extent that the acceleration of land-treatment measures under existing authorities is not possible, we urge that adequate authorities for such acceleration be sought through amendment of those basic authorities.

Your staff, on the other hand, believes that the Department cannot properly meet its responsibilities under the Flood Control Act unless the full program envisioned in the report is authorized under that act. Your representatives, however, agreed that appropriations for land-treatment phases implementing the program recommended in the report, upon approval by the Congress generally on the basis as submitted, would be sought as additions to going program appropriations of the agencies carrying on the work. Funds for structural works or measures would still be requested under the appropriation "Flood control." The total obligations for land treatment and structural measures in each authorized flood-control project area could, of course, be shown in a summary table to be presented in the program and performance section of the annual budget document.

Subject to the above understanding as to the method of presenting the budget for flood-control programs, there would be no objection to the submission of the proposed Sny watershed flood-control survey report to the Congress. In the event the report or any modification thereof is approved by the Congress, submission of requests for appropriations must be justified in accordance with the policy set forth in the President's letter of July 21, 1950, which directed that all civil public works be considered with the objective, as far as practicable, of deferring, curtailing, or slowing down those projects which do not directly contribute to national defense or to civilian requirements essential to the changed international situation, or as may later be modified.

In submitting the Department's report to the Congress, it will be appreciated if you include a copy of this letter.

Sincerely yours,

ELMER B. STAATS,
Assistant Director.

LETTER FROM THE GOVERNOR OF ILLINOIS TO THE SECRETARY OF AGRICULTURE

OFFICE OF THE GOVERNOR,
Springfield, December 22, 1950.

OFFICE OF THE SECRETARY,
United States Department of Agriculture,
Washington, D. C.

DEAR SIR: The proposed report of the Department of Agriculture on a program of runoff and waterflow retardation and soil-erosion prevention, the Sny watershed, Illinois, forwarded by your letter of July 21, 1950, has been reviewed by the division of waterways, department of public works and buildings of this State.

The conclusions and recommendations of the division of waterways relative to the subject report were submitted to the State Water Resources and Flood Control Board on December 19, 1950. After full consideration of the report, the board has reported favorably thereon.

Upon the recommendation of the board, and after due consideration of all facts in connection with the subject report, I approve the project as set forth in the report.

Very truly yours,

ADLAI E. STEVENSON, *Governor.*

LETTER FROM THE CHIEF OF ENGINEERS TO THE SECRETARY OF AGRICULTURE

DEPARTMENT OF THE ARMY,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, October 11, 1950.

The honorable the SECRETARY OF AGRICULTURE.

DEAR MR. SECRETARY: Reference is made to letter of July 21, 1950, from the Assistant Secretary of Agriculture forwarding for information and comment copies of the report by the Department of Agriculture on the upper Mississippi River watershed interim survey report on the Sny watershed, Illinois.

The watershed of the Sny, a tributary and former bypass channel of the Mississippi River, is located in Pike, Adams, and Calhoun Counties in western Illinois. The portion of the Sny Basin considered in this report consists of 547 square miles of uplands lying northeast of the Mississippi River bluffs and is drained by numerous tributaries. These tributaries originate within 20 miles of the Sny, flow through narrow valleys, cut through the deep loessial soils of the uplands, and discharge their silt-laden waters onto the Mississippi River bottom lands.

The report recommends that the Federal Government undertake an extensive program for runoff and waterflow retardation and soil erosion prevention to be installed over a 20-year period. The proposed improvement program consists of watershed treatment for retarding erosion, sedimentation, and flood runoff by means of modification in types of land uses, forest planting, terracing, strip cropping, contouring, fence relocation, minor watershed improvements, diversions, retarding structures, and tributary channel improvements.

It is noted that the total cost of the recommended improvement program is estimated at $9,794,183 based on 1948 prices, including maintenance during the installation period of which $6,542,777 would be Federal and $3,251,406 or its equivalent would be non-Federal. It is also noted that the total average annual costs of operation and maintenance to local interests after the 20-year installation period are estimated at $83,516 or its equivalent. The total average annual economic costs, including interest on and amortization of investments using 2½ percent interest rate for Federal and 4 percent rate for non-Federal cost is $357,251. The estimated average annual benefit from the recommended program at 1948 prices is shown to be $1,677,607 of which $676,888 is conservation benefit, $117,236 land enhancement, and the remainder reduction in erosion, sediment damage, and inundation. The report states that the ratio of the estimated average annual benefit of $873,185 to the average annual cost of $243,518 is 3.59 to 1.00 based on future price and cost levels assumed to prevail under an intermediate level of employment during the period 1955–65.

The Corps of Engineers, pursuant to an act of Congress approved July 24, 1946, is authorized to construct flood-control works for the prevention of interior flooding within the Sny bottom lands. The report of the Corps of Engineers contained in House Document No. 713, Seventy-ninth Congress, second session, describes the adverse effects of uncontrolled soil and gully erosion prevalent on the upland area of the Sny Basin, and the need for soil conservation measures to protect the lands and prevent silt and sand from being carried to the

Sny bottom lands. It appears that the plan proposed by the Department of Agriculture will meet this need and advantageously operate in combination with the plan for flood control proposed in House Document 713. It will be noted, however, that full benefits from the proposed program for the Sny uplands cannot be realized until after the 20-year installation period.

The recommended program of runoff and waterflow retardation and soil-erosion prevention in the upland part of the Sny watershed is considered advisable and will advantageously operate in combination with the flood-control plan recommended by the Corps of Engineers and authorized by Congress for the protection of the bottom lands of the basin.

The opportunity of reviewing your report is appreciated.

Sincerely yours,

LEWIS A. PICK,
Major General,
Chief of Engineers.

LETTER FROM THE ASSISTANT SECRETARY OF THE INTERIOR TO THE SECRETARY OF AGRICULTURE

DEPARTMENT OF THE INTERIOR,
OFFICE OF THE SECRETARY,
Washington 25, D. C., November 6, 1950.

Hon. CHARLES F. BRANNAN,
Secretary of Agriculture, Washington 25, D. C.

MY DEAR MR. SECRETARY: In accordance with Federal Inter-Agency River Basin Committee procedures, Assistant Secretary Hutchinson transmitted by letter dated July 21, 1950, for the information and comments of the Department, copies of the Department of Agriculture's survey report on Sny watershed, Illinois.

The report recommends a program of runoff and waterflow retardation in the upland part of the Sny watershed in Illinois at an estimated cost of about $6,500,000 to the Federal Government and $3,250,000, or its equivalent to local interests, making a total estimated cost of nearly $10,000,000. The program will be operated and maintained at an estimated annual cost of about $83,000 or its equivalent, to local interests. It is estimated that the total annual average benefit from the recommended program will be about $1,670,000, of which approximately $870,000 results from reduction in floodwater damage and sediment damage, and approximately $800,000 from associated benefits, including open land conservation, and increased crop yields.

The Sny survey report is principally concerned with sediment and erosion control rather than flood control. The measures suggested include adjustments in land use, forest planting, pasture establishment, terracing, strip cropping, contouring, fence relocation, stabilizing structures on minor waterways, diversions, floodwater retarding structures, and tributary channel improvements. The report indicates that effective use of all available hydrologic data has been made. However, since the calculations at a number of points are based on estimates, it is evident that available data are not adequate for the most economical design of the project works. Because most of the anticipated beneficial effects of the recommended land practices and

structures are based on research on small plots, further study is needed to determine the downstream and off-site results of these recommendations. Moreover, it is suggested that water and sediment gaging stations be installed at an early date to evaluate and to demonstrate the benefits achieved by the program. The results of such evaluation and demonstration would be useful not only in relation to this project but in other similar areas.

The report does not discuss the possible damage to farm water supplies or remedial measures such as low-flow dams to maintain ground water levels during drought periods. Subsurface drainage rather than maintenance of high ground water levels appears to be the major problem in the watershed; however, domestic supplies should be considered and protected.

The regional office of the Fish and Wildlife Service of this Department commented briefly on the general features to be presented in the proposed report by letter dated May 26, 1947, on the basis of an oral discussion of the proposed plan. The Department feels that the over-all plan as proposed would be of general benefit to the fish and wildlife resources of this watershed.

Information is not available as to the exact locations for remedial measures which would accomplish the predicted reduction in floodwater and sediment damage. The adjustments in intensity of land use and the planting of 5,240 acres of forest would be beneficial to those species of upland wildlife indigenous to the area. The establishment of some 4,400 acres of pasture, terracing of about 65,000 acres of cropland, strip cropping of some 9,300 acres of cropland, and the contouring of about 19,000 acres of land should be beneficial in effect on upland wildlife. Wildlife values can probably be enhanced in the relocation of approximately 1,700 miles of fence, if consideration is given to the use of miltiflora rose as living fence.

In connection with the improvement of minor watershed waterways it is indicated that about 4,000 square miles will be affected and that about 2,500 stablizing structures will be built. In addition 60 miles of stream will be diverted and 40 upstream floodwater retarding structures will be constructed. Further studies on these phases of the program are necessary to determine their effect on the fish and wildlife resources. The Department recognizes the regard which the Soil Conservation Service has for the importance of these resources and anticipates that proper safeguards would be taken to prevent any losses.

The land-enhancement program involving upstream floodwater retarding structures contemplates the conversion of bottom land brush and woodland to cropland. Similar programs involving farm drainage and clearing in the Illinois River Basin have, in the past, eliminated valuable wildlife habitat which often had a greater value for the game and fur animals produced there than it did when converted into an expensive farming development. These wildlife losses should be carefully considered in arriving at farm benefits.

The report does not mention any specific development in the interests of fish and wildlife. It is recommended that the program of the Department of Agriculture include consideration of fish and wildlife management opportunities in farm and woodland planning, and in the management of public lands in the watershed. Specifically, opportunities exist for field border plantings and control of badly

eroded lands which can furnish food and cover for wildlife when protected from grazing. Such practices are adaptable and complementary to the waterflow retardation and erosion-prevention features of the recommended program. The development and management of farm ponds to include fish production and utilization are also considered a logical part of the entire program in the basin.

The Department recommends that every effort be made to encourage landowners to recognize fish and wildlife production opportunities in farm planning, and to coordinate the long-range program of the Department with the State agencies responsible for fish and wildlife conservation and management. Participation by the State in the over-all program for the watershed may be assisted substantially by the Federal aid to wildlife restoration program administered by the Fish and Wildlife Service. At such time as the program is authorized the Department will appreciate the opportunity to cooperate with your Department and the State of Illinois in effectuating the program to obtain the maximum benefits to fish and wildlife resources.

The report indicates, and it has been amply demonstrated in work of this nature done by the Department of the Interior agencies, that more basic facts are necessary before great improvements can be made in methodology of analysis. There is particular need to know more of the relation between the observations made on small plots and the flow of streams of the size contemplated in these plans. Moreover, it becomes increasingly clear that as the work contemplated under the flood-control reports is installed in the field, sound programs of evaluation and analysis must be initiated in order that the estimates of the effect of land management on water and land can be progressively improved as time goes on. Agencies of the Department would be pleased to cooperate in investigations looking toward evaluation and analysis of field programs.

The proposed program will benefit departmental interests within the basin, particularly if opportunity is afforded the Fish and Wildlife Service to participate, should the program be authorized.

Opportunity to review the report is appreciated.

Sincerely yours,

WILLIAM E. WARNE,
Assistant Secretary of the Interior.

LETTER FROM THE CHAIRMAN OF THE FEDERAL POWER COMMISSION TO THE SECRETARY OF AGRICULTURE

FEDERAL POWER COMMISSION,
Washington 25, September 28, 1950.

Subject: The Sny watershed, Illinois.

Hon. CHARLES F. BRANNAN,
Secretary of Agriculture, Washington 25, D. C.

DEAR MR. SECRETARY: The comments herein with respect to your Department's interim survey report on the Sny watershed, Illinois, are transmitted in response to the Assistant Secretary's letter of July 21, 1950. The transmittal of these comments is in accordance with established procedures of the Federal Inter-Agency River Basin Committee.

The Sny River, a former bypass channel of the Mississippi River, drains an area of 742 square miles in western Illinois. A prominent bluff line runs longitudinally through the watershed approximately parallel to the Mississippi River, dividing the area into two distinct parts: The Mississippi River flood plain comprising about 195 square miles of almost level ground; and the upland area of 547 square miles, a hilly and rolling region situated on the average about 175 feet above the flood plain. Flood protection measures for the flood plain are included in plans of the Corps of Engineers approved by the 1946 Flood Control Act.

The interim survey report recommends a program for runoff and waterflow retardation and soil-erosion prevention in the upland area of the Sny River Basin, consisting of forest planting, terracing, pasture development, channel improvements, upstream floodwater-retarding structures, and other similar measures. The program would be developed during a 20-year period at an estimated total cost of about $9,794,000, based on 1948 price levels, of which about $6,542,000 would be Federal expenditure. Annual benefits were estimated to be $873,185 and annual costs about $243,518. The resulting ratio of benefits to costs is about 3.59.

The Commission staff has reviewed the report of your Department primarily with a view to determining whether the plan of improvement would affect existing or potential hydroelectric power plants or offer any possibilities for hydroelectric power development. There are no existing hydroelectric power plants in the basin and the possibilities of developing power in the basin are limited owing to the low average runoff. There may be opportunity, however, for developing large amounts of power at several potential developments on the Mississippi River downstream from the point where the Sny enters the main river.

The afore-mentioned measures recommended in the interim survey report will have little, if any, effect on the hydroelectric power potentialities, either within or outside the basin. It may be expected that some water will be lost through transpiration, with the large-scale planting envisioned in the report. On the other hand, with a greater proportion of the rainfall percolating into ground water, to run off later at a slower rate, the probable net effect on future hydroelectric power may be beneficial. The staff reports that there are no possibilities for the development of power in connection with the improvements proposed in your program.

The Commission appreciates the opportunity of reviewing and commenting on the report of your Department.

Sincerely yours,

MON C. WALLGREN, *Chairman.*

LETTER FROM THE ASSISTANT SURGEON GENERAL TO THE ASSISTANT SECRETARY OF AGRICULTURE

FEDERAL SECURITY AGENCY,
PUBLIC HEALTH SERVICE,
Washington 25, D. C., October 26, 1950.

Mr. K. T. HUTCHINSON,
Assistant Secretary, Department of Agriculture,
Office of the Secretary, Washington 25, D. C.

DEAR MR. HUTCHINSON: Pursuant to the policies and procedures by the Federal Inter-Agency River Basin Committee, we have reviewed the report furnished by your Department entitled, "The Sny Watershed, Illinois, June 1950 (Report of Appendixes 1, 2, 3, and 4)."

Due to time limitations, a memorandum is not being submitted, although this will be the procedure in our review of future reports. We are hereby giving clearance to this report and are sending a copy of this letter to the Secretary of the Federal Inter-Agency River Basin Committee for his information.

Sincerely yours,

M. D. HOLLIS,
Assistant Surgeon General,
Associate Chief, Bureau of State Services.

LETTER FROM THE DIRECTOR OF THE BUREAU OF FOREIGN AND DOMESTIC COMMERCE TO THE ASSISTANT SECRETARY OF AGRICULTURE

UNITED STATES DEPARTMENT OF COMMERCE,
BUREAU OF FOREIGN AND DOMESTIC COMMERCE,
Washington, D. C., November 9, 1950.

Hon. K. T. HUTCHINSON,
Assistant Secretary of Agriculture, Washington, D. C.

DEAR MR. SECRETARY: We have reviewed the Department of Agriculture's report on the Sny watershed, Illinois, and find we have no specific comments to make on it. Thank you for your courtesy in submitting it to us.

Sincerely,

H. B. MCCOY, *Director.*

UNITED STATES DEPARTMENT OF AGRICULTURE

UPPER MISSISSIPPI RIVER WATERSHED
INTERIM SURVEY REPORT

THE SNY WATERSHED
ILLINOIS

Program for Runoff and Waterflow Retardation and
Soil Erosion Prevention

Pursuant to the Act approved June 22, 1936 (49 Stat. 1570),
as amended and supplemented

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APPENDIXES

List of appendixes made in connection with the report (these appendixes are not printed in this document).

I. Description of watershed.
II. Damage.
III. Program proposal.
IV. Program appraisal.

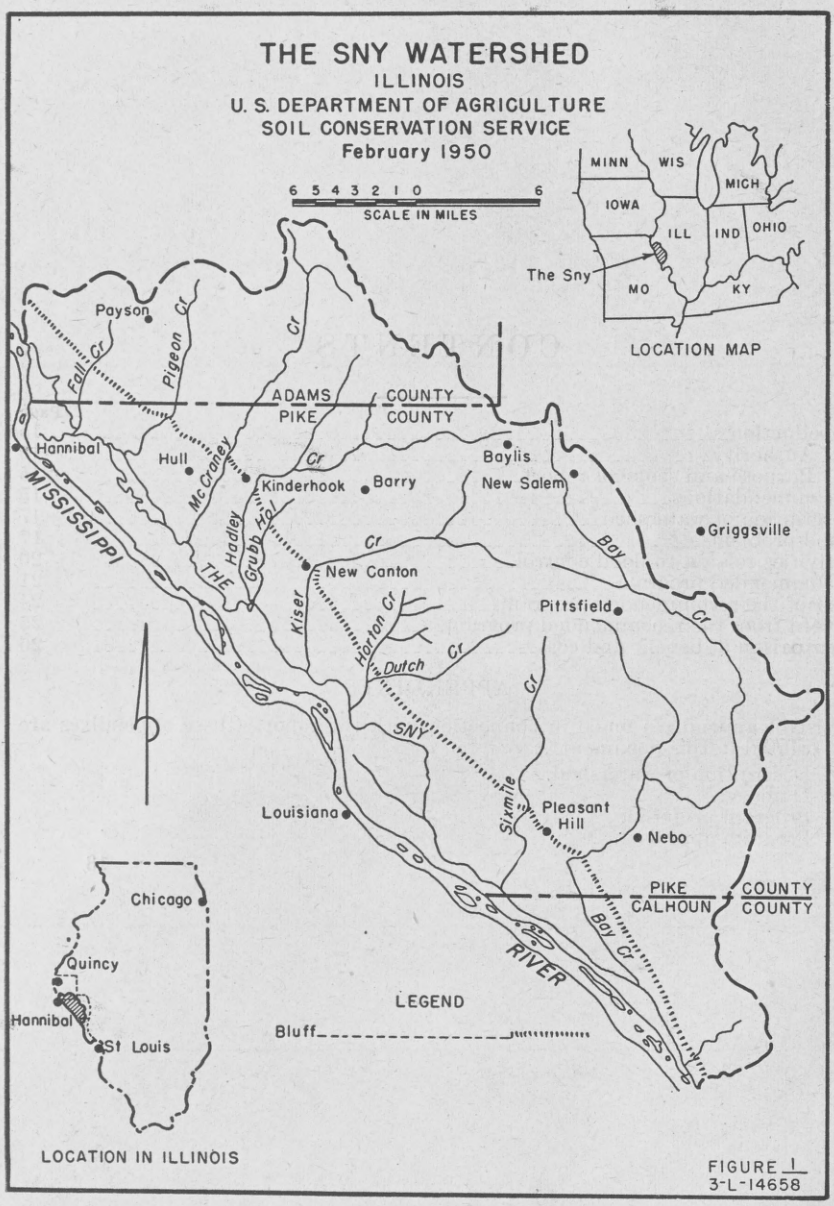

FIGURE 1
3-L-14658

SNY WATERSHED, ILLINOIS

INTRODUCTION

Authority

This interim report is submitted under the provisions of the act approved June 22, 1936 (49 Stat. 1570), as amended and supplemented.

Purpose and scope of report

The purpose of this interim report is to outline a program of runoff and waterflow retardation and soil-erosion prevention for the Sny watershed in Illinois, subwatershed of the upper Mississippi River watershed, and to present recommendations for its installation and maintenance, together with an analysis of the costs and benefits thereof.

The Sny, a former bypass channel of the Mississippi River, has a total drainage area of 742 square miles. Recommendations in this report apply only to the upland part (547 square miles) of the watershed. Recommendations for flood control for the Mississippi River flood plain area of the watershed (195 square miles) have been developed by the Department of the Army, Corps of Engineers.

It is anticipated that a survey will be conducted and a report submitted on the remainder of the upper Mississippi River watershed at a later date under authority contained in the above acts.

RECOMMENDATIONS

It is recommended that a program of runoff and waterflow retardation and soil-erosion prevention be installed during a 20-year period in the upland part of the Sny watershed in Illinois at an estimated cost to the Federal Government of $6,542,777 and at an estimated cost to local interests of $3,251,406 or its equivalent,[1] making an estimated total cost of $9,794,183 for the installation of the complete program.

The program will be operated and maintained at an estimated annual cost of $83,516 or its equivalent to local interests. Of this amount, it is expected that an estimated $55,371 or its equivalent will be expended by farm owners and operators, under agreements with soil conservation districts, for maintaining farm conservation measures and for the increased cost of operating a more profitable system of conservation farming. It is expected that the remaining $28,145 or its equivalent will be expended by a local agency or agencies acceptable to the Secretary of Agriculture for operating and maintaining those installations which are not considered a part of normal farm operations.

[1] Labor, materials, equipment, land easements, rights-of-way, and other contributions in lieu of cash payments.

The program herein recommended includes the intensification, acceleration, and adaptation of certain activities under current programs of the Department of Agriculture, and additional measures not now regularly carried out in such programs, all of which are necessary to complete a balanced runoff and waterflow retardation and erosion-control program for the watershed. It is recommended that the Secretary of Agriculture be authorized to carry out this program. Although the current activities of the Department primarily related to the Flood Control Act are not included in the program herein specifically recommended, this program is based on the continuation of such current activities at least at their present level.

The recommended program includes measures and practices that contribute directly to substantial and measurable reductions in floodwater and sediment damage. The measures that will accomplish this objective are estimated to be as follows:

1. Adjustments in intensity of land use in accordance with the needs and capabilities of the land.
2. Forest planting, 5,240 acres.
3. Pasture establishment, 4,424 acres.
4. Terracing, 64,556 acres.
5. Strip cropping, 9,310 acres.
6. Contouring, 19,165 acres.
7. Relocating fence, 1,717 miles.
8. Improvement of minor watershed waterways, 3,970 miles (including construction of 2,477 stabilizing structures).
9. Diversions, 60 miles.
10. Construction of upstream floodwater retarding structures, 40.
11. Tributary channel improvement, 16 miles.

Technical assistance will be made available for planning and applying the necessary land-use adjustments, for planning and applying conservation measures on the watershed, and for integrating the measures included in the recommended program. Conservation educational assistance will be provided to facilitate the installation of the recommended program.

In order to achieve the objectives of the recommended program, the Secretary of Agriculture may make such modifications or substitutions of the measures described herein as may be deemed necessary or advisable on account of changed physical or economic conditions or improved techniques.

The authority of the Secretary of Agriculture to prosecute the recommended program shall be supplemental to all other authority vested in him, and nothing in this report shall be construed to limit the exercise of powers heretofore or hereafter conferred on him by law to carry out any of the measures described herein or any other measures that are similar or related to the measures described herein.

The attainment of the flood-control benefit evaluated in this report is dependent upon the installation and proper maintenance of all phases of the recommended program.

It is estimated that the recommended program will yield an annual benefit of $1,667,607. Based on prices and costs expected to prevail under intermediate employment levels during the period 1955 to 1965

the ratio of the average annual benefit to the average annual cost is 3.59 to 1.00.

It is anticipated that the recommended program will be installed under cooperative agreements with individuals and with soil conservation districts, State and local governments, or other agencies acceptable to the Secretary of Agriculture.

DESCRIPTION OF WATERSHED

The watershed of the Sny, a tributary of the Mississippi River, has an area of 742 square miles, located in Pike, Adams, and Calhoun Counties in western Illinois (fig. 1). The area extends along the northeastern side of the Mississippi River for some 50 miles. A prominent bluff line separates the 195-square-mile section of Mississippi flood plain, through which the Sny flows, from the upland area. The upland area of 547 square miles is dissected by a series of streams which emerge at more or less regular intervals along the bluffs and make their way across the flood plain to join the channel of the Sny. The principal tributaries and their approximate drainage areas are Bay Creek, 178 square miles; Hadley Creek, 73 square miles; Kiser Creek, 60 square miles; McCraney Creek, 50 square miles; Six Mile Creek, 34 square miles; Pigeon Creek, 26 square miles; and Dutch Creek, 21 square miles. These creeks, which originate less than 20 miles from the Sny, have steep gradients through deep narrow valleys cut in the loess-covered uplands. From the bluff lines to the Sny the gradients are much flatter. Considerable stream-bank erosion results from migrating channels, and the streams carry large quantities of sand, silt, and debris.

The topography in the upland area ranges from steep hills in the bluff section to rolling land in the headwaters. Most of the area is covered with deep loessial soils consisting mainly of silty material, which becomes coarser in texture near the bluff areas adjacent to the Mississippi River flood plain. Before it was settled, about 10 percent of the area was prairie and most of the remainder was forest. Soil and slope conditions on about 55 percent of the area are suitable for cultivation, under proper management.

Average annual precipitation of 37 inches based on United States Weather Bureau record, period 1898 to 1949, and a 6-month growing season provide conditions favorable to agriculture.

In 1940 about 90 percent of the area was in farms and 40 percent of the farms were tenant-operated. The estimated population of the watershed in 1940 was 18,595 of which 50 percent lived on farms. Pittsfield, county seat of Pike County, with a population of about 3,000 in 1940 is the largest city in the watershed. In 1945 farms averaged 189 acres in size of which half was used as cropland and 40 percent as pasture. On more than half of the farms livestock furnished the principal income. Cash grain was the second most important type of farming.

FLOOD PROBLEMS

Based upon detailed records of floods on Bay Creek and Hadley Creek during the 10 years 1940 to 1949, inclusive, the tributaries of the Sny experience damaging flood stages on an average of four times annually. Approximately 60 percent of the damaging flood stages

occur during the growing season. High-intensity storms of short duration during the growing season cause rapid runoff accompanied by serious soil erosion. Floods in the tributaries are characterized by rapidly rising and falling stages and seldom remain as high as damaging stage for longer than 24 hours.

Flood records prior to 1940 are not complete. Since then, however, automatic water-stage recording stations, installed on Bay Creek and Hadley Creek, have furnished satisfactory records. Within the past 11 years both Bay Creek and Hadley Creek have had the highest floods within the memory of inhabitants of the area. The highest Bay Creek flood which occurred in August 1946 had a peak discharge of 23,500 cubic feet per second from the 162 square-mile watershed above Nebo. Hadley Creek had its greatest known flood in August 1939 when the estimated peak discharge was 22,000 cubic feet per second from its 73 square-mile watershed.

The flood problem has been aggravated by intensive farming of cropland to corn and small grain, overgrazing of pasture and woods, and by leaving land idle without protective cover. Approximately 54 percent of the damaging sediment originates from sheet erosion in the highly erodible loessial soils. Gully erosion contributes 18 percent, streambank erosion 18 percent, and flood-plain scour 10 percent of the damaging sediment.

Due to the type of farming that has been followed, much of the natural protection of the land from erosion and excessive runoff has been destroyed. Stable waterways for the disposal of runoff water from the farms to the streams are almost nonexistent. Instead, from small to relatively large noncrossable gullies exist in their places. Efforts have been made by individual farmers to correct this condition by grading in the smaller field type of waterways and seeding them to grass. Such operation has not proved satisfactory in many places since stable outlets for them are rare in the Sny watershed. Such condition has retarded the use of farming operations on the contour which is necessary on much of the cultivated upland if a stabilized agriculture is to be maintained.

Serious erosion problems exist throughout the watershed. In the uplands sheet erosion has reduced the average topsoil depth by more than 50 percent. The present average rate of soil loss due to sheet erosion is estimated to be 2,097 acre-feet per year. Upland gully erosion is damaging 424 acres of land each year and is producing nearly 700 acre-feet of sediment annually. In addition to this damage to productive land the gully systems develop to the point that it is no longer possible to properly manage the undamaged areas under the present land use. This results in changes in land use on crop and pasture land due to dissection of the area by the gullies, causing a depreciation in land values.

On the bottom land serious streambank erosion has taken place. Nearly 7,400 acres along tributary streams have been damaged to date to the extent of being removed from production or having their productivity greatly reduced. The present rate of bank erosion is approximately 134 acres per year. In addition, floodwaters have scoured and cut channels in the bottom lands affecting 2,500 acres and thereby damaged the productive capacity of good agricultural land.

Inundation damage to crops and pastures by floodwaters on the bottom land of tributaries is most serious when inundation occurs

during the growing season, thereby reducing the yield of the cropland and pasture areas. Miscellaneous agricultural damage includes fence losses, debris accumulation, and related items. Urban and public utility damage includes flooding of the town of Nebo on Bay Creek and damage to telephone and electric lines. Damage to transportation facilities includes increased maintenance costs to replace ballast and realine railroad tracks, loss of business due to traffic delays and rerouting, and the washing out of highway road surfacing and bridge abutments.

Sediment damages are of serious proportions. Damage by sediment includes infertile overwash, swamping, damage to reservoirs and ponds, transportation facilities, and to the proposed Corps of Engineers program. It also includes bulking of flood flows.

Overwash has damaged more than 5,000 acres of bottom land along the tributaries by reducing crop yields an estimated 21 percent. Swamping has damaged approximately 3,400 acres by an estimated 40 percent. The capacity of the Pittsfield water-supply reservoir has been reduced nearly 37 percent by sedimentation from the beginning of storage in June 1925 to December 1946. Fourteen hundred farm water-supply reservoirs are rapidly losing storage capacity because of sediment transported by floodwaters. Sediment damage to highways and roads causes about one-third of the annual road-maintenance cost which is necessary for removing sediment from ditches and culverts. Similar sediment damage occurs along the 34 miles of railroads. Sediment damage to growing crops and to urban areas has been included with inundation damage.

Sediment damage to the Sny drainage channels and desilting basins in the Mississippi River flood plain is of major importance. Approximately 70 percent of the material eroded from the uplands has been transported onto the Mississippi River flood plain. Deposition has necessitated frequent channel dredging, levee improvement, and the construction of many desilting basins which fill up rapidly. The Department of the Army, Corps of Engineers, has proposed a plan of improvement which will reduce this sediment damage by an estimated 60 percent by constructing two large desilting reservoirs and four major diversion channels across the main bottom of the Sny. Maintenance funds for these works have been set up by the Corps of Engineers primarily to deal with future sediment damage to the proposed installations.

In addition to the direct floodwater and sediment damage to property, indirect damage is important in the watershed. Some of the more evident forms of indirect damage are interruption, dislocation, and breakdown of trade and transportation, care and rehabilitation of flood victims, cost of sanitation and restoration of public works, and other demands on public funds and services. Less apparent but equally important are losses that result from migration and shifting of population; decadence and impoverishment of communities; destruction of balances, integrations, and other interrelations both in business and agriculture; disruption of educational facilities and the administration of other public institutions; weed contamination; spreading of livestock diseases; and other dislocations in social and economic relations within the region. Besides the direct and indirect damages there are other damages which were not evaluated.

Table 1 lists the monetary evaluation of the average annual floodwater and sediment damages in the Sny watershed.

TABLE 1.—*Estimated average annual monetary damage, the Sny watershed, Illinois (1948 prices)*

Type of damage	Average annual damage		
	Direct	Indirect	Total
Erosion damage:			
Sheet erosion	$208,046	$20,800	$228,846
Gully erosion	599,571		599,571
Stream-bank erosion	29,975	1,499	31,474
Flood-plain scour	2,870	144	3,014
Subtotal	840,462	22,443	862,905
Damage due to inundation:			
Agricultural	186,096	27,914	214,010
Nonagricultural	20,134	9,060	29,194
Subtotal	206,230	36,974	[1] 243,204
Sediment damage:			
Infertile overwash	6,603	330	6,933
Swamping	8,286	414	8,700
Reservoirs and ponds	27,864	6,966	34,830
Transportation facilities	24,818	1,240	26,058
Corps of Engineers proposed program	7,684		7,684
Subtotal	75,255	8,950	84,205
Total average annual damage	1,121,947	68,367	1,190,314

[1] Includes $1,143 due to bulking of flood flows by sediment.

ACTIVITIES RELATED TO FLOOD CONTROL

The Department of Agriculture through four of its bureaus—Production and Marketing Administration, Extension Service, Forest Service, and the Soil Conservation Service—is presently engaged in installing some works which cause substantial reduction in floodwater and sediment damage. An appraisal was made of the work of these agencies in the Sny watershed. It was found that the portions of the programs of these agencies which involved intensity of use of land, terracing, contouring, strip cropping, pasture establishment, forest planting, and establishment of grass waterways have substantial effects on floodwater and sediment damage.

The Production and Marketing Administration, through its agricultural conservation program, has been making payments for work of this nature as well as providing incidental education and information assistance. The Extension Service, through its farm advisors and extension specialists, has been encouraging this work. The Forest Service, through the State Division of Forestry, has been participating in the fire-control, forest-planting, and technical-assistance programs. The Soil Conservation Service, through work with the Adams, Pike, and Calhoun County Soil Conservation Districts, has been providing technical assistance and necessary information for the planning and installation of these measures. Through these existing authorities the United States Department of Agriculture is now expending $19,807 annually in the Sny watershed to accomplish this work.

The Department of the Army, Corps of Engineers, has prepared a survey report for the Sny which was published in July 1946 as House

Document 713, Seventy-ninth Congress, second session. In this report the flood problems and damages were evaluated for the 195 square-mile area of the Mississippi River flood plain, and a flood-protection plan was recommended. Following the submission of this survey report, a project was authorized by section 10 of the Flood Control Act of July 24, 1946 (60 Stat. 641). The act provides that the project is authorized substantially in accordance with the recommendations of the Chief of Engineers in his report dated April 17, 1946, included in House Document 713 referred to above. A definite project report dated January 13, 1950, has been prepared by the Rock Island (Ill.) District of the Corps of Engineers.

The Illinois State Division of Forestry is furnishing technical assistance to the woodland owners, supplying trees for the establishment of forest cover, and protecting woodland against fire.

Soil conservation districts have been established in all three counties in the watershed. The districts were organized in June 1942 in Adams County, in June 1946 in Pike County, and in April 1948 in Calhoun County. The Adams County Soil Conservation District has been in operation since late in 1942, the Pike County District since 1947, and the Calhoun District since 1948. A land-use program has been developed by the soil conservation districts within the watershed. These districts, organized by farmers, make it possible for the farmers to work together for mutual benefit in the establishment of soil conservation practices.

The Sny Island Levee Drainage District was organized in 1870. It includes 172 of the 195 square miles of Sny bottomland. The expense of attempting to prevent drainage ditches from silting has been very high and the results have not been entirely successful. Eight desilting basins have been built in an effort to trap the sediment before it reaches the ditches. Five of these are now completely filled. Because of silting of the ditches it has been impossible to maintain adequate drainage throughout the district and large areas of formerly productive land have reverted to wasteland.

RECOMMENDED PROGRAM

The recommended program of runoff and waterflow retardation and soil-erosion prevention in the upland part of the Sny watershed includes the following measures:

Adjustments in intensity of land use in accordance with the needs and capabilities of the land

Table 2 shows the land-use changes necessary in order to use the land in accordance with its capability. The capability recommendations were made jointly by the United States Department of Agriculture and the University of Illinois College of Agriculture. The capability class of land is based upon the combination of soil, slope, erosion, length of slope, and other physical properties related to land. The land-use capability recommendations show the intensity to which land can be used in accordance with its capability class. These recommendations give consideration to the use of associated measures such as terracing, strip cropping, and contouring. Recommended practices and measures, when applied to individual farm units, will vary depending upon the classes of land and the type of operating

unit. Therefore, consideration has been given to the practicability of installing such practices and measures on a farm unit basis in order to develop a program that would be feasibly applicable.

As can be seen in table 2, the land has been farmed too intensively. Such methods of farming have caused removal of much of the topsoil, depleted the soil of organic matter and nutrients, causing inadequate vegetative protective cover conducive to low infiltration rates which result in rapid and excessive runoff and land deterioration. Through the recommended conversion of land use with the necessary associated measures, the soil erosion and runoff from the land can be reduced to a minimum thereby causing substantial reduction in floodwater and sediment damages.

TABLE 2.—*Land-use changes, the Sny watershed, Illinois*

	Land use			Land use	
	Present	Planned		Present	Planned
	Acres	*Acres*		*Acres*	*Acres*
Clean-tilled	57, 440	40, 002	Grazed woodland	39, 876	1, 036
Small grain	40, 394	29, 315	Other land	21, 714	9, 949
Hay and rotation pasture	41, 790	81, 079			
Permanent pasture	73, 603	68, 536	Total	281, 881	281, 881
Ungrazed woodland	7, 064	51, 964			

Forest planting

Land suited to woodland usage and now used for this purpose will remain in woodland. Present woodland areas and open areas converted to woodland, having insufficient soil stabilizing and runoff retarding vegetation, should be planted to forest trees. Grazing and other abuses which have converted woodland to flood and sediment source areas should be corrected by proper management practices such as protection against grazing and improper harvesting practices. Such management will also provide added income from woodland products.

Pasture establishment

Pasture establishment is needed on land converted from cropland and idle land to pasture to reduce damaging water runoff and sedimentation. This type of land is yielding excessive runoff and sediment. Suitable seedings of legumes and grasses are needed with sufficient application of fertilizer and lime to provide for the establishment of this pasture.

Terracing

The regulation of both the concentration and velocity with which free water moves over the surface of the ground may be accomplished by controlling the length of slopes over which the water moves. Where slopes are sufficiently long or steep to favor damaging concentrations and velocities, shortening them by use of appropriate mechanical barriers prevents these unfavorable conditions arising. Terracing is the most effective barrier used for this purpose and with the use of terraces proper use of the land can be realized with the least disturbance to the economy of the average farm.

By terracing, a field is divided into several small watersheds. The short slopes thus formed, plus the use of a cropping plan, soil treatment and cultural practices adapted to that field, will allow only a minimum of runoff water to attain a scouring velocity. Terraces are needed on cropland to conduct runoff at nonerosive velocities to stabilized outlets and watercourses. The installation of terraces will permit the most intensive use of cropland consistent with attaining the objectives of the program. Due to the nature of the soil, only graded terraces have been considered. Such terraces require outlets, either natural (waterways) or the constructed (artificial) type. Without these outlets which are discussed in subsequent paragraphs the amount of terracing in the recommended program would be limited.

Strip cropping

Strip cropping is the use of alternate meadow crops with either clean-tilled or small-grain crops in contoured bands on a hillside. The purpose of this practice is to reduce the length of slope over which surface water may travel on unprotected (clean-tilled or small grain) land. When applied, in combination with the proper intensity of use of land, soil, and water losses from a field can be reduced to a minimum.

Contouring

Contouring is farming land on the level. By doing this, channel flow of runoff is kept to a minimum until the water reaches a waterway. Each crop row provides a miniature barrier that impounds the water it collects. Contouring of clean-tilled and small-grain crops greatly reduces the soil and water losses when these crops are used in the proper sequence with meadow. This practice is adaptable on much of the cropland.

Relocating fence

In order to facilitate farming land on the contour and contribute to a better pattern of land use, it is desirable to relocate fences in order that a redivision of fields can be made to conform with farming activities. Fencing of pasture where adjacent to woods is necessary.

Diversions

Diversions are recommended to be built above actively advancing overfalls of small gullies to direct the runoff water into stabilized waterways. In some instances, water from several gullies may be concentrated into one channel which has been stabilized by structures or vegetation. It has been found that this is the most feasible and economical method of control in many cases. Diversions are also being recommended to divert excess runoff from upland fields to adequate waterways in order that local flooding can be prevented on bottomland directly below those fields. They are also used to divide long slopes of fields which are too irregular to terrace.

Minor watershed waterways

Adequate systems for the disposal of runoff water are a necessary part of the program to reduce floodwater and sediment damage. During the years the Sny watershed has been farmed the area has been dissected by gullies which have eliminated many of the native stable water-disposal systems in the minor watersheds. These dissecting gullies, large and small, are a major source of sediment and prevent

the establishment of land use which will reduce soil and water losses to a minimum. It is recommended that these minor watershed waterways be stabilized in order that safe disposal of runoff water be provided. These waterways provide outlets for terrace systems, they eliminate noncrossable gullies so that fields can be contoured or strip-cropped, and they reduce the sediment contribution from gullies to a minimum. Some of the waterways may be established by blading in the gully and seeding to the proper grass mixture. These are generally the shallower ones which have the lower gradients where velocities of water are within allowable limits for vegetation alone.

The larger gullies having steeper gradients even with their banks sloped will develop floodwater velocities in excess of those safe for vegetation. Therefore stabilizing structures such as chutes, notch spillways, and drop inlets are required to reduce the waterway gradients, thereby reducing floodwater velocities to a point that the waterways may be safely protected with vegetation. These structures in some cases will have detention features principally for the purpose of, but not limited to, reducing velocities of the floodwater in the waterway below them.

Upstream Floodwater Retarding Structures

The upstream floodwater retarding structures located in the headwaters of tributaries of the Sny are designed to furnish protection for flood-plain areas by providing temporary storage for runoff. They will reduce inundation damage and permit a more intensive use of the bottomland protected. Drainage areas above the structures average about 3.5 square miles each. These structures will be earthfill dams through which a small, low elevation outlet conduit uncontrolled by gates or valves will be constructed to draw down the temporary storage. A spillway adapted to site conditions and meeting adequate design criteria will be used to provide an outlet for flood flow in excess of a storage capacity of approximately 3 inches of runoff.

Tributary Channel Improvement

The objective of tributary channel improvement measures is to reduce erosion damage from streambank erosion and floodplain scour. This type of control measure will reduce bank cutting, reduce sediment damage, and produce a reduction in flood stages by increasing channel efficiency through removal of objectionable debris. Protection is recommended for valuable cropland areas, highways, railroads, bridges, utilities, farm buildings, and other high-value improvements being endangered by streambank cutting as well as high sediment-producing areas. Bank cutting is often one of the main sources of damaging sediment.

COST OF THE RECOMMENDED PROGRAM

The estimated cost of installing the recommended program for the Sny watershed is shown in table 3. Approximately 5 percent of the estimated installation cost is for technical assistance, 1 percent for extension education, and 1¼ percent for the administration of direct aids. The estimated average annual cost of operating and maintaining the recommended program after the 20-year period of installation is also shown in table 3.

TABLE 3.—*Estimated cost of the recommended program, the Sny watershed, Illinois (1948 prices)*

Item	Installation cost	Annual maintenance	Item	Installation cost	Annual maintenance
Forest planting	$146,219		Diversions	$22,037	$199
Pasture establishment	141,967		Upstream floodwater retarding structures	2,672,000	6,680
Terracing	1,034,395		Tributary channel improvement	183,240	3,190
Strip cropping	10,125		Increased farm operating cost		55,371
Contouring	9,865				
Fence relocation	539,385		Total cost	9,794,183	83,516
Minor watershed waterway improvement:					
Sloping and seeding	1,319,450	$2,316			
Stabilizing structures	3,715,500	15,760			

The distribution of cost, based on 1948 prices, is summarized below:

	Installation cost	Annual maintenance cost	Equivalent average annual value
Federal	$6,542,777		$163,569
Non-Federal	3,251,406	$83,516	193,682
Total	9,794,183	83,516	357,251

In computing the equivalent average annual value, a 2½-percent interest rate was used for Federal and a 4-percent rate for non-Federal cost.

BENEFIT FROM THE RECOMMENDED PROGRAM

The benefit that will result from installation of the recommended program includes reductions in erosion, inundation and sediment damage, enhancement of bottomlands, and increased income to landowners and operators in the watershed. The full attainment of the benefit evaluated in this report is dependent upon the cooperation and support of farm owners and operators and local governments in installing and maintaining the recommended practices and measures.

The estimated average annual monetary value of this benefit is shown in table 4.

The benefits due to the reduction of the erosion, inundation, and sediment damages accrue by virtue of reducing and retarding runoff at its source. This reduces the production of sediment by controlling erosion and regulates flood flows in the tributary streams. It is estimated that this program will reduce erosion damage by 85 percent, inundation damage to crops, pastures, and nonagricultural interests by 36 percent, and sediment damage by 75 percent. Land enhancement results from measures which make possible more intensive use of floodplain lands. Additional benefit will accrue in the form of increased crop yields following installation of the land treatment portion of the program.

COMPARISON OF BENEFIT AND COST

Converting 1948 prices and costs to those expected to prevail under intermediate employment levels during the period 1955 to 1965, the ratio of the average annual benefit ($873,185) to the average annual cost ($243,518) is 3.59 to 1.00.

TABLE 4.—*Estimated average annual benefit from the recommended program, the Sny watershed, Illinois (1948 prices)*

Reduction in erosion damage:	
Sheet erosion	$210, 538
Gully erosion	509, 853
Stream-bank erosion	11, 055
Flood-plain scour	220
Subtotal	731, 666
Reduction in damage due to inundation:	
Agricultural	86, 569
Nonagricultural	1, 789
Subtotal	88, 358
Reduction in sediment damage:	
Infertile overwash	4, 733
Swamping	6, 173
Reservoirs and ponds	29, 165
Transportation facilities	19, 904
Bulking of flood flows	596
Corps of Engineers proposed program	2, 888
Subtotal	63, 459
Conservation benefit	676, 888
Land enhancement	117, 236
Total average annual benefit	1, 677, 607